Pipe Advisory Group Meeting Minutes - September 12, 2002

Attendees

Rod Powers, FDOT
Paul Mize, FDOT
Doug Todd, Contech
Jim Schluter, Uni-Bell
Jim Park, ADS
Rick Traylor, Rinker
Michelle French, Hancor
Jeff Enyart, Hardie Pipe
Ed McCloskey, Hanson
Chuck Taylor, Hanson
Angel DeJesus, Hanson
Ted Price, Rinker
Sid Hilton, RMC Ewell
Rico Sadovnik, Contech
Rob Adamson, Contech
Jeff Hite, Rinker
Alberto Sagues, University of South Florida
Brian Blanchard, FDOT
Ron Craig, Hanson
Terry D. Handsec, S.E. Metal Pipe Assn.
Rob Bottema, Hardie Pipe
Marc Ansley, FDOT (part time)
Rick Renna, FDOT

Preliminaries

Brian Blanchard, State Roadway Design Engineer, welcomed the P.A.G. participants, and voiced his support for continued communication with the pipe industry.

Updates on FDOT Initiatives

FDOT's Flexible Pipe Liveload Study

Marc Ansley updated the Group on FDOT's Flexible Pipe Liveload Study, stating that the status for the remaining project deliverables is as follows:

1. Volume II: received 1 month ago
2. Volume III (Test Data and Analysis): 9/14
3. Volume IV (Conclusions): 10/15

The current studies – Ansley's study, Dr. Reddy's study on HDPE service life, Renna's study of design service life approach – are being reviewed and will be discussed with FDOT upper management in late November. To minimize industry instability, the Department hopes to make one broad policy change rather than several small changes. For this same reason, the Department will not speculate on the outcome of the studies, but will clearly communicate preliminary decisions to the effected industries, probably in December, and ultimately to the entire P.A.G. at the next meeting in January.

"Corrosion Resistance and Service Life of Drainage Culverts," FDOT Project No. 0510756

Dr. A. A. Sagues, USF, presented the recently completed study, "Corrosion Resistance and Service Life of Drainage Culverts," FDOT Project No. 0510756. The project seeks to evaluate the corrosion performance of concrete pipe in a salt water environment. Dr. Sagues noted that the ingress of

chloride ions into the sampled concrete pipe was surprisingly rapid. With the low concrete cover over the steel in the pipe, initiation of corrosion happening fairly quickly visible damage did not occur for a long time. He indicated that the worst corrosive condition was with intermittent salt water ponding such as might be found within the splash zone and that lab and field diffusion coefficients compared well. Dr. Sagues suggested that increasing cement content in the pipe's concrete mix – possibly a separate concrete class for marine environments - would provide a helpful increase in the corrosion initiation period.

Confidence Based Pipe Design Service Life Approach

Rod Powers gave a presentation entitled, "Confidence Based Pipe Design Service Life Approach", outlining an approach to add levels of confidence to the current "pass / fail" design service life approach. This same presentation was given to the FDOT District Drainage Engineers in August.

Pipe Supplier Issues

Florida Concrete Pipe Institute – Concerns Regarding Fiber Reinforced Concrete Pipe (Continued from Last Meeting)

Rick Traylor outlined their concerns on FRCP as detailed in his letter dated April 19, 2002 – See page 3 – 5 of these minutes. Jeff Enyart responded as discussed in his letter of June 12, 2002 –see the executable icon page 5. Open discussion ensued between Mr. Traylor and Mr. Enyart containing numerous disagreements. One particular disagreement – whether or not Australia has accepted a flexible design approach for FRCP – will be documented by Rinker and communicated to Hardie Pipe and the FDOT. Mr. Renna requested the both Rinker and Hardie Pipe write second letters, within one month, to the FDOT summarizing their responses to each others first letters and verbal arguments. The Department will then respond in writing to both Rinker and Hardie Pipe.

Florida Concrete Pipe Institute – Miscellaneous Issues

Angel DeJesus briefly discussed the miscellaneous issues outlined on pages 6 – 7 of these minutes. An additional question was raised whether FRCP should be stamped with its design class or its class as reflected by its actual wall thickness. The Department will consult FDOT Construction and will respond in writing to all the above concerns. Ron Craig suggested that Hardie Pipes increased thickness should be an indicator to the Department of the structural insufficiency of FRCP as currently specified by the FDOT. Mr. Renna responded that any designer must decide how to design for actual construction practice – that construction specs are not always followed in the field.

Closing Issues

Mr. Renna, after discussion with the Group, set the next meeting for mid-January from 9 am – 2 pm, and thanked the Group for their courteous demeanor in the midst of appropriate, professional confrontation. The meeting was dismissed promptly at 12:55 pm.

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April 19, 2002

Mr. Rick Renna, P.E.
Florida Department of Transportation
State Drainage Engineer
605 Suwannee Street
Mail Station 32
Tallahassee, Florida 32399-04595

Dear Mr. Renna:

As you know, Rinker Materials Hydro Conduit always maintained the position that fiber cement pipe (FCP), as allowed by the Department in Section 941, is not equal to reinforced concrete pipe. Ongoing developments in Australia with AS 4139 validate our concerns. The purpose of this letter is to list and summarize our concerns, and if possible, meet with you and the FCP manufacturer to discuss them.

Please find the enclosed copy of The Proposed Revision of AS 4139-1993 "Fibre-Reinforced Concrete Pipes & Fittings", prepared by James Hardie Research & Product Development, dated November 1, 2001. This submittal, while we believe it is ultimately aimed at reducing wall thicknesses by using semi-rigid or flexible design methods, states that if designed as a rigid pipe, FCP exhibits creep under sustained saturated loading conditions and should be designed through the application of regression analysis. Specifically, these recommendations include using the regression factor (R), the dry / wet factor (C), and a factor of safety of 1.5 times the design service load. This design method has been used in Australia since 1993. While we still have key misgivings concerning long-term durability and strength of the product, we will continue to support this design when viewing FCP as a rigid equal to concrete pipe.

The proposed semi-rigid approach is based on flexible pipe standards and seems to need much improvement. In any case, we will withhold comment on this design approach. FCP was incorporated into Section 941 as a rigid concrete pipe. It is allowed as an equal, class for class. The only restriction is that is not allowed under traveled lanes of interstates. We ask for your consideration of the following concerns.

- FCP manufactured in the United States has already experienced failures but pipe manufactured in Australia reportedly has a good track record. We believe that a major contributing factor to this is wall thickness. Pipe made to AS 4139 design requirements has test loads 50 percent higher than pipe made to FDOT requirements. The Australian pipe, with a higher factor of safety built in, has significantly thicker walls than pipe made in Florida.

RT02-0402.doc

The AASHTO Technical Section on Rigid Pipe voted negative on the ballot for the provisional standard that mirrored the FDOT specification. Major concerns included considering FCP as equal to reinforced concrete pipe, strength loss, confusing terminology, and long-term strength in sustained saturated loading.

- We believe the failures for FCP in America are mainly due to the less conservative specification being used, which results in much thinner walls. We are aware of cases of end delamination, joint breakage, and broken backs. In some cases, we have discovered circumferential breaks before the product was buried.

It is our understanding that the FCP manufacturer initially furnished Australian made pipe for trial installations, but that all pipe being supplied now is manufactured in Florida. In the Department's evaluation of this product, were durability studies conducted on locally supplied pipe?

AS 4139 requires the dry / wet factor (C) to be determined and the determination shall be repeated when the manufacturer changes the design, manufacturing method, or the materials, notwithstanding a minimum frequency of two years. The Department's approval of FCP was based on Australian made pipe with a (C) factor of 1.183. Has (C) been substantiated in Florida on Florida pipe?

The cellulose fiber used is hygroscopic in nature and it has a very high absorption percentage. Since it is an organic fiber, why doesn't it biodegrade? Has data been provided that demonstrates the cellulose fiber in saturated FCP does not biodegrade?

In addition to biodegradation, we would expect absorption to affect wet / dry cycling and freeze / thaw resistance. Have these properties been addressed for FCP?

James Hardie Building Products include a fiber cement roof shingle, and there is a Class Action Settlement against the company for the product. This product's main difference to FCP is the cement content; otherwise, it is practically the same composition as FCP. The Settlement defines damage that includes delaminating, crumbling or separating into layers, cracking, and disintegrating. This settlement reinforces our concern with durability. More information can be found at http://www.hardieroofingclaims.com/.

Most of these questions will need to be answered by the manufacturer. Rather than presenting them at a meeting and expecting an immediate response, we thought it would be helpful to provide these questions to Hardie Pipe in advance. We would like to include these questions and the manufacturer's input at the next Pipe Culvert Advisory Group meeting.

We look forward to the Department's upcoming research, and we are committed to help and provide input. In light of the developments with AS 4139 and while your research is just beginning, we ask that you consider changing the requirements for FCP manufactured to Section 941. The change we recommend would be to 941-1.7. This section currently states, "The minimum dry crush load shall not be less than a factor of 2 times the long-term service load". We recommend changing it to read, "The minimum dry crush load shall not be less than a factor of **3 times the long-term service load**." This change will only require FCP in America to have comparable wall

thickness to FCP in Australia, and it is consistent with the manufacturer's efforts to modify AS 4139 to include rigid and semi-rigid design methods.

Sincerely,

Rick Traylor
Manager Technical Services

Cc: Jeff Enyart, Hardie Pipe
Joe Zicaro, P.E., Rinker Materials Hydro Conduit

"Hardie Response to Rinker FDOT Letter J

Agenda Items: (In order of Priority)

1)- Documentation, reporting and record keeping of video taping & deflection tests in accordance with section 430-4.8.

2)- A review of the roughness coefficients for all FDOT accepted pipe materials. The concrete pipe industry promotes its products as having design values of 0.012 and 0.013 that are historically and widely accepted in the engineering community. The 20 to 30 percent **design factor** included by the concrete pipe industry takes into account the differences between laboratory testing and actual installed conditions. The use of design factors is good engineering practice and, **to be consistent for all pipe materials**, the applicable Manning's "n" laboratory value should be increased a similar amount in order to arrive at design values.

There is a phenomenon known in the industry as "Corrugation Growth", which is observed at the inside surface of some types of HDPE pipes after installation, whose impact on the hydraulic performance of these type of pipes, to our knowledge have not been investigated in Florida.

3)- Joint Gap tolerances for all alternate pipe materials. How much pipe should be left inside the joint after installation for all optional pipe materials, to assure 1)- Joint Performance over the full expected service life of the pipeline (consider potential soil settlement effects on future joint gaps – **in other words, don't use all of the joint extensibility solely during the installation**), 2)- That manufacturers installation recommendations in terms of joint gaps & misalignment are followed.

4)- Practical review of the durability of all pipe materials based on present field experiences & history. The future of Florida infrastructure economic expenditures as related to drainage pipelines, depend in great deal on the decisions made at the present. The FDOT has a very good and comprehensive corrosion and service life estimating process. What may still be missing is a correlation of the past and present design processes with actual field installations. Ex.: Do we have research to substantiate that all type pipes are performing as expected in their different environmental conditions? Looking at the FDOT research center website, it looks like a recent study on the Life Expectancy of Reinforced Concrete Pipe based on laboratory studies and some field correlation was completed. Are there any life expectancy research projects planned for other type pipes?

5)- Reduction of the compaction requirement around concrete pipe from 100% to 95%.

6)- Acceptable repair procedures for all kinds of alternate drainage pipe materials. Inevitably damage to the ends and other sections of the pipe will occur on the projects. Reinforced Concrete Pipe having been the most widely used drainage product for the longest period of time, have a set of well known repair procedures adequately covered by several different applicable & enforceable specification documents. Examples of these enforceable specifications are found on Section 941 & ASTM-C-76. Do we have a clear set of enforceable specifications to cover all the other alternate pipe materials presently allowed by the FDOT?

7)- Hydrostatic Pressure Rating of pipe joints for applications exceeding the 2 psi requirement for "Soil Tight" category.

8)- A definition of the maximum pipeline length that can be visually inspected versus videotape inspection.